Alg. 2 Warm Up #11-1

1. Give the exact radian measure for each angle:

a) 90° b) 30° c) 120° d) 330° e) 135°

2. Give the exact degree measure for each angle:

a) $\frac{\pi}{4}$ b) $\frac{5\pi}{3}$ c) $\frac{3\pi}{4}$ d) $\frac{7\pi}{6}$ e) 3π

What about:

1) $15^\circ \cdot \frac{\pi}{180^\circ}$

$\frac{\pi}{12}$

2) $\frac{\cancel{420}^{\circ}}{1} \cdot \frac{\pi}{\cancel{180}^{\circ}}$ (420 → 21 → 7; 180 → 9 → 3)

$\frac{7\pi}{3}$

3) $\frac{4\cancel{\pi}}{15} \cdot \frac{180^\circ}{\cancel{\pi}}$

$4 \cdot 12$

48°

4) $\frac{9\cancel{\pi}}{5} \cdot \frac{180^\circ}{\cancel{\pi}}$

$9 \cdot 36$

324°

Homework Questions: Green WS

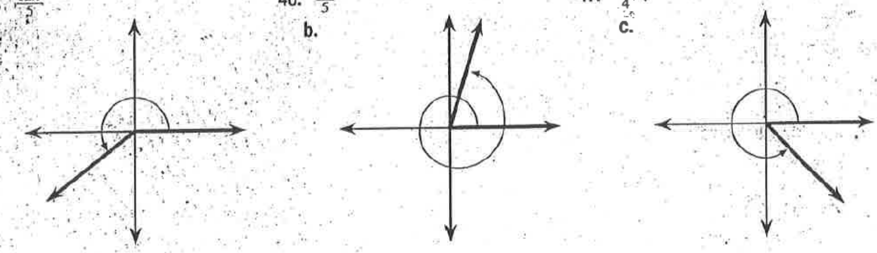
In 45–47, match the measure with the angle.

45. $\frac{12\pi}{5}$

46. $\frac{6\pi}{5}$

47. $\frac{7\pi}{4}$

a. b. c.



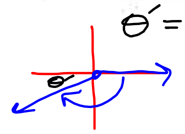
In 10–21, sketch the angle. Then find its reference angle. (Note: The angle measure in Exercises 14–21 is radians.)

10. $-225°$

11. $315°$

12. $-150°$

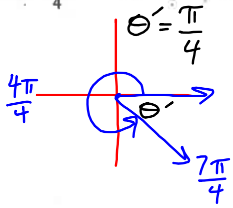
$\theta' = 30°$



13. $65°$

14. $\frac{7\pi}{4}$

$\theta' = \frac{\pi}{4}$



15. $-\frac{2\pi}{3}$

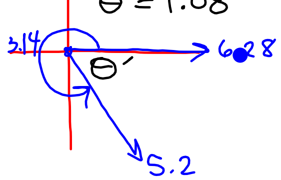
16. $\frac{13\pi}{4}$

17. $\frac{7\pi}{3}$

18. 5.2

$\theta' = 6.28 - 5.2$

$\theta' = 1.08$



19. 1.0

20. -3.2

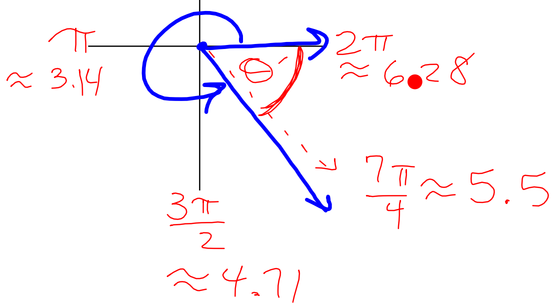
21. 2.7

HW Questions:

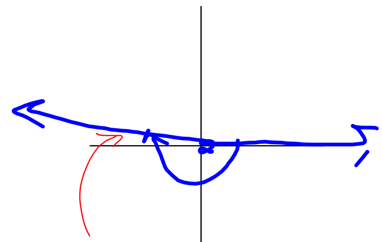
18) 5.2

$\theta' \approx 6.28 - 5.2$

$\theta' \approx 1.08$



20) - 3.2

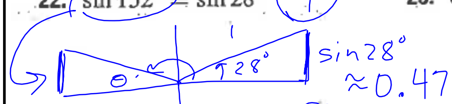


$\theta' \approx 3.2 - 3.14$

$\theta' \approx 0.06$

In 22–27, without using a calculator, decide whether the equation is true or false. Then use a calculator to verify your decision.

22. $\sin 152° = \sin 28°$ T

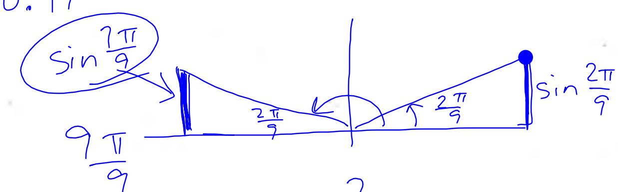


23. $\cos 225° = -\cos 45°$ T

27. $\sin \frac{7\pi}{9} = \sin \frac{2\pi}{9}$

25. $\cos \frac{5\pi}{4} = \cos \frac{\pi}{4}$

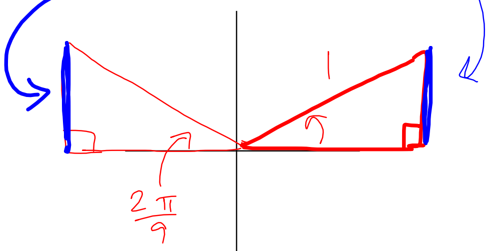
$$\begin{array}{r} 180 \\ -152 \\ \hline 28° \end{array}$$



$$\sin \frac{7\pi}{9} \stackrel{?}{=} \sin \frac{2\pi}{9}$$

$\approx 0.64 \qquad \approx 0.64$

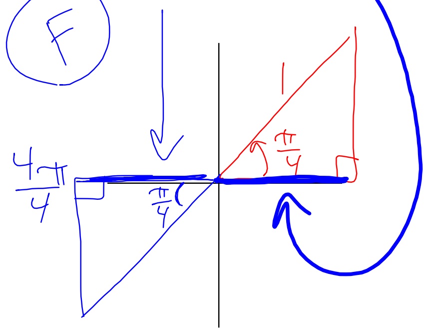
27) $\sin \frac{7\pi}{9} \stackrel{?}{=} \sin \frac{2\pi}{9}$



True

25) $\cos \frac{5\pi}{4} \stackrel{?}{\neq} \cos \frac{\pi}{4}$

F



$$\cos \frac{5\pi}{4} = -\cos \frac{\pi}{4}$$

$$= -\frac{\sqrt{2}}{2}$$

In 33–38, rewrite the degree measure in radians.

33. 135° 34. 40° 35. 260°

36. 215° 37. −340° 38. 210°

$$215° \cdot \frac{\pi}{180°}$$

$$\frac{215\pi}{180} = \boxed{\frac{43\pi}{36}}$$

In 39–44, rewrite the radian measure in degrees.

39. $\frac{7\pi}{12}$ 40. $-\frac{5\pi}{6}$ 41. $\frac{2\pi}{3}$

42. $\frac{13\pi}{4} \cdot \frac{180^\circ}{\pi}$ 43. $\frac{8\pi}{3}$ 44. $\frac{\pi}{6}$

$\frac{13 \cdot 180^\circ}{4}$

585°

On Scratch Paper: Solve. Think about best approach.

1. $\frac{x+6}{2x} - 4 = \frac{10}{x}$ 2. $\frac{5}{x-4} + \frac{6}{x} = 2 + \frac{11}{x}$

3. Convert: degrees <---> radians

a) $\frac{11\pi}{12}$ b) $\cancel{72}^{\circ} \cdot \frac{\pi}{\cancel{180}^\circ}$ c) $\frac{14\cancel{0}^{\circ}}{1} \cdot \frac{\pi}{18\cancel{0}^\circ}$ (7 above 140°, 9 below 180°)

165° $\frac{2\pi}{5}$ $\frac{7\pi}{9}$

1. $\frac{2x}{1}\left(\frac{x+6}{2x} - 4\right) = \frac{10}{x}\cdot\frac{2x}{1}$

$\frac{\cancel{2x}}{1}\cdot\frac{(x+6)}{\cancel{2x}} - 4(2x) = \frac{20\cancel{x}}{\cancel{x}}$

$x + 6 - 8x = 20$

$-7x = 14$

$\boxed{x = -2}$

2. $\frac{5}{x-4} + \frac{6}{x} = 2 + \frac{11}{x}$

$-\frac{6}{x} \qquad -\frac{6}{x}$

$\frac{5}{x-4} = \frac{2}{1}\cdot\frac{x}{x} + \frac{5}{x}$

$\frac{5}{x-4} = \frac{2x+5}{x}$

$(2x+5)(x-4) = 5x$

$2x^2 - 8x + 5x - 20 = 5x$

$-5x \qquad -5x$

$2(x^2 - 8x - 10) = 0$

$x^2 - 8x - 10 = 0$

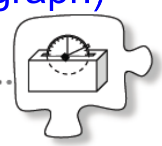
$x^2 - 4x + \underline{4} = 10 + \underline{4}$

$\sqrt{(x-2)^2} = \sqrt{14}$

$\boxed{x = 2 \pm \sqrt{14}}$

CP's: 7- #99 ---> 103 (white WS & graph) p. 341

7.1.7 What is tangent?



The Tangent Function

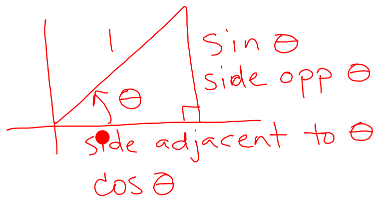
In the past several lessons, you have used your understanding of the sine and cosine ratios to develop and interpret the functions $s(\theta) = \sin\theta$ and $c(\theta) = \cos\theta$. In this lesson, you will expand your understanding by exploring the tangent ratio and graphing the function $t(\theta) = \tan\theta$.

a) $\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{\sin\theta}{\cos\theta}$

7-99. Jamal was working on his homework when he had a brilliant realization. He was drawing a triangle in a unit circle to estimate the sine of $\frac{\pi}{10}$, when he realized that this triangle is the same kind of triangle that he draws when he wants to find the slope of a line.

a. How could you express the slope of the radius in terms of sine and cosine?

b. Is there any other way you can use a trigonometric ratio to represent the slope? Discuss this with your team.



$\tan\theta = \frac{\text{opp}}{\text{adj}}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

7-100. THE TANGENT FUNCTION

Obtain the Lesson 7.1.7 Resource Page from your teacher. Use your knowledge of sine, cosine, and tangent to create a graph of the tangent function. Conduct a full investigation of the tangent function. Be prepared to share your summary statements with the class.

Discussion Points

Does every angle have a tangent value?

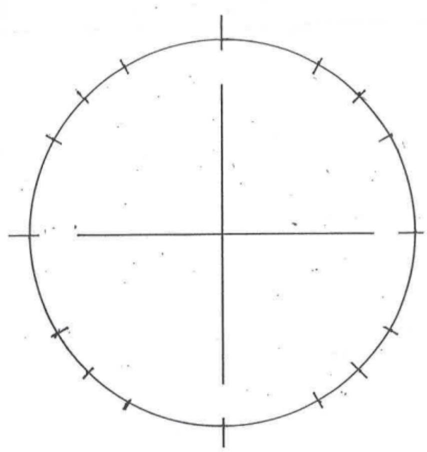
How is the tangent graph similar to or different from the sine and cosine graphs?

Why does the tangent graph have asymptotes?

7-101 a) Complete the table: (Use special Δ's and Unit Circle)

Radians θ	Exact $\cos\theta$	Exact $\sin\theta$	Exact $\tan\theta$	Approx. $\tan\theta$
0				
$\frac{\pi}{6}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\frac{1}{\sqrt{3}}$	0.58
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$			
$\frac{\pi}{3}$	$\frac{1}{2}$			
$\frac{\pi}{2}$				
$\frac{2\pi}{3}$				
$\frac{3\pi}{4}$				
$\frac{5\pi}{6}$				
π				
$\frac{3\pi}{2}$				
2π				

Draw Δ's on the unit circle below to figure out slopes ($\tan\theta$)



Further Guidance

7-101. For each triangle in the first quadrant of the unit circle on your resource page, label the sine and cosine.

a. Use your knowledge of tangent to complete a table like the one below. Start with the exact values for the sine and cosine.

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$ (exact)	$\tan\theta$ (approximate to nearest 0.01)
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$	
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$		
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$		

b. Plot the tangent values on the graph to the right of the unit circle.

c. Draw five new triangles that are congruent to the first five, but that are located in the second quadrant. Add values for these new angles to your table and your graph.

d. Continue this process by drawing triangles in the third and fourth quadrants. You should have a total of twenty triangles drawn and twenty angle values on your graph. If you have not done so already, add data to your table and points to your graph corresponding to the intercepts of the unit circle.

7-102. Investigate the tangent graph by analyzing the following questions:

a. Describe the domain and range of the tangent function.

b. Describe any special points or asymptotes.

c. Does it have symmetry? Describe any symmetry you see in the graph.

d. How is the graph of $t(\theta) = \tan\theta$ different from the graphs of $s(\theta) = \sin\theta$ and $c(\theta) = \cos\theta$?

Further Guidance section ends here.

7-103. Draw a new unit circle and label a point that corresponds to a rotation of $\frac{\pi}{6}$ radians.

a. What are the coordinates of this point? Use exact values.

b. Use this information to find each of the following values without a calculator. (Hint: Drawing each angle on the unit circle will be very helpful.)

i: $\tan\left(\frac{7\pi}{6}\right)$ *ii*: $\cos\left(\frac{13\pi}{6}\right)$ *iii*: $\tan\left(\frac{2\pi}{3}\right)$

HW: 7-

#104 ---> 112

Short Quiz Tuesday:
Solving Quadratics all three ways.
Changing Radians <---> Degrees.
Solving a Radical Equation

EC: Something from the Unit Circle